PID-8CH-SSR Multi-Loop Controller Instruction Manual

1. Features:

1.1. 8 channels of temperature controls are packed into 160 x 80 x 110mm case

8 kinds of combinations of temperature set value, PID constant, alarm set value, etc.

1.1.Input Sensor Types

Thermocouple (temperature input): K, J, T, E, S

Resistance thermometer (temperature input): Pt100, CU50

1.2.Control Outputs

A control output can be a relay output, voltage output (for driving SSR), or current output, depending on the model.

1.3.Adjusting PID Constants

Can be easily set the optimum PID constants by performing AT (auto-tuning) with the limit cycle method.

1.4.Standard Alarms

Can be output an alarm when the deviation, process value, set point, or manipulated value reaches a specified value.

1.5.Use this controller within the following allowable range:

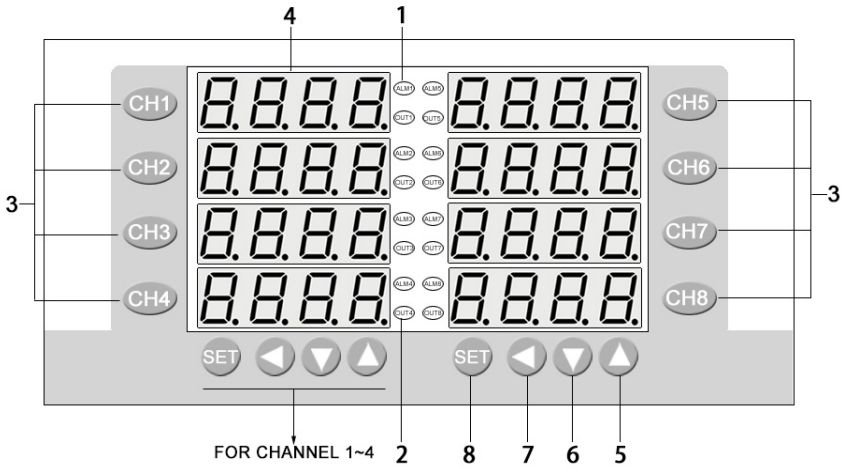
Allowable ambient temperature: −0 to +55 °C

Allowable ambient humidity: 5 to 85 % RH.

2. Dimensions:

h×w×d(Unit: mm) 160×80×85 Panel cutout 152×76

3. Parts Description:



1 ALM: lamp Lights when Event occurs

2 Output lamp: Lights when output is turned on

3 Channel key:

You can press 'CH1~8' for 3 seconds to enter into corresponding channel menu.

4 PV display:

Displays Measured value (PV)

5 Up key:

Increase numerals.

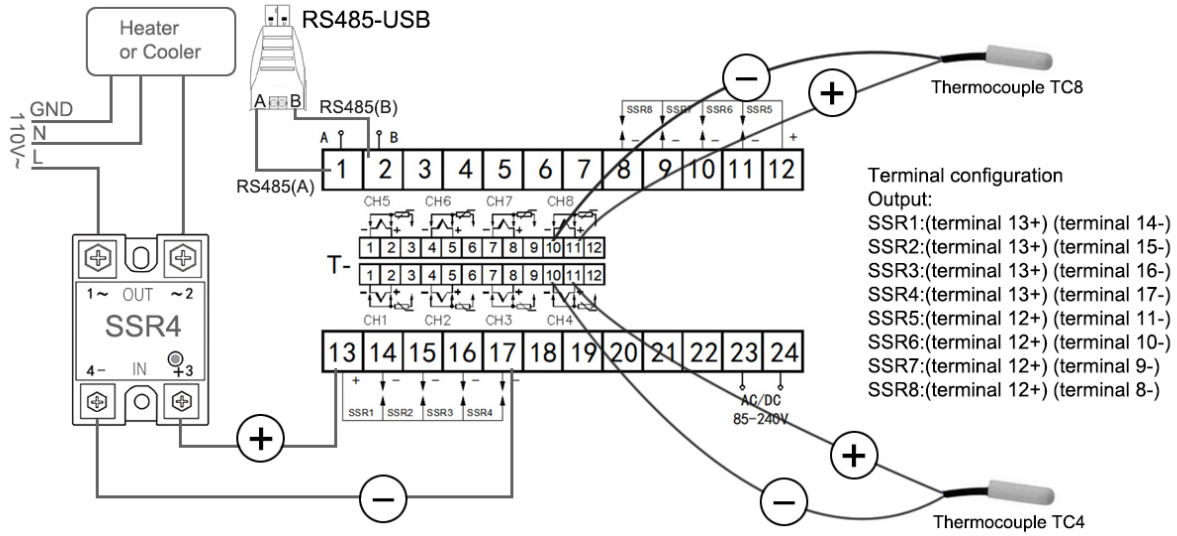
6 Down key:

Decrease numerals

7Shift key: Shift digits when settings are changed.

8 Set (SET) key: Used for parameter calling up and set value registration.

4. Terminal Arrangement:



5. Parameters

ID	Symbol	Name	Manual	Setting range	Ex-Factory
The public parameters(First level)					
0	Lock	Set data lock	LOCK=18, Set data unlock LOCK≠18, Set data lock.	0～50	18
1	TS	Input type	Cu50; Pt2 (pt100); K; E;J;T; S	-	-
2	ALP	Alarm type	0: Alarm function OFF; 1:Process high alarm; 2:Process low alarm; 3: Deviation High alarm ; 4: Deviation low alarm; 5: Band alarm 6: Out of band alarm.	0-6	0
3	Kt	PID control cycle.	PID control response time	____	120
4	Dp	Decimal point position selection	Set the position of the decimal point for the measured value to be displayed.	0-1	1
5	P-SH	Range high	Input range.		0
6	P-SL	Range low			9999
7	C-F	Measured value (PV) unit select	C: Celsius F: Fahrenheit If the value is changed, the controller needs to execute Auto-tuning again. Refer to 6.Auto-tuning	C , F	C
8	Addr	Address	Communication address can be set from 0 to 255	1～255	1

9	Baud	Communication speed	1200; 2400; 4800; 9600;	-	9600
The Parameters of each channels(Second level)					
0	SP+N (1~4)	Setting Values Of channel N,(N=1-4)	Set the temperature set value (SV) which is the target value for control	Determined by P-SL P-SH	100
1	AL+N	Alarm value	Please refer to **ALP** for the alarm mode suitable.		0
2	PB+N	PV Bias	The value set in the PV bias is added to the actual input value to correct the input value.	±20.0	0.0
3	kP+N	Proportional band	Set when PI or PID control is performance. For heating / cooling PID action. **When P=0,the controller is ON/OFF control**	1～100	100
4	kI+N	Integral time	Eliminates offset occurring in proportional control.	0～3000	500
5	kD+N	Derivative time	Prevents overshoot and/or undershoot caused by integral action effect..	0～2000S	100S
6	Hy+N	Differential gap	When the control is ON/OFF control(P=0) Relay contact may repeat its turning ON and OFF due to input fluctuation if measured value (PV) is near the alarm set value.the differential gap setting can prevent the relay contact from ON or OFF repetition.	0.1～50.0	1.0
7	AT+N	Auto tuning	1: AT with learning start 0: AT with learning stop	0～1	0
8	COL+N	Hot/Cold	'0':reverse control(heating) '1':positive control(cooling)	0～1	0

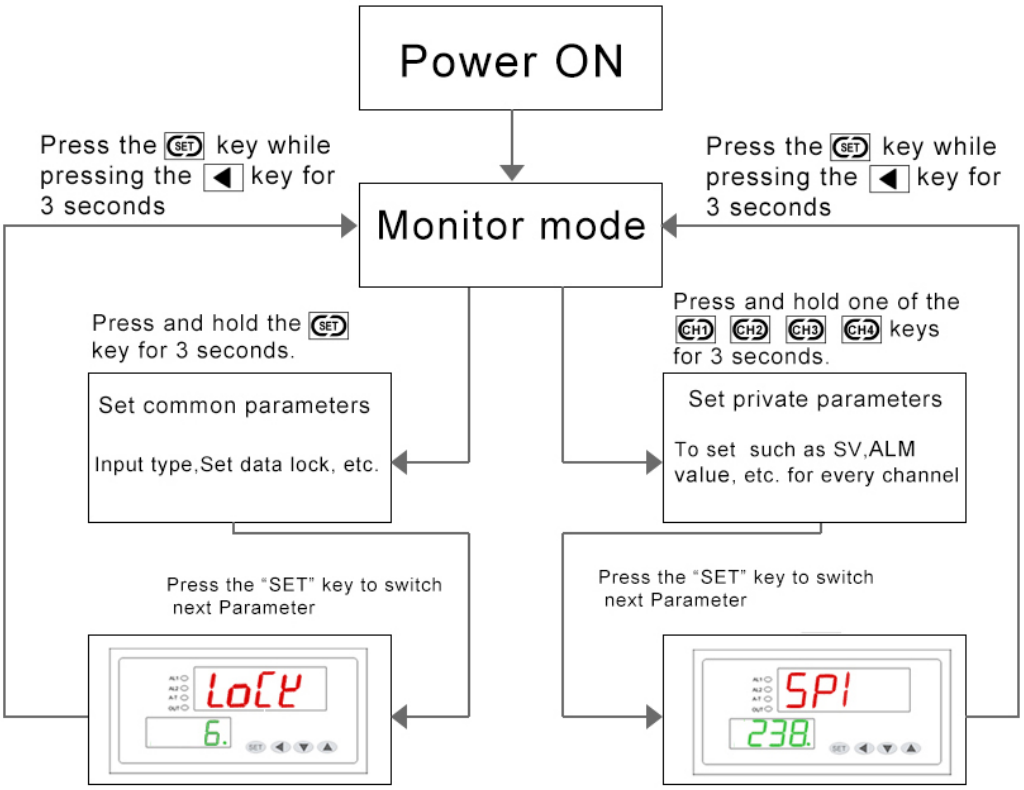
6. Operation

6.1 First level menu setting

Press SET key for 3 seconds around enter first level menu, meanwhile the first route display window and the second display window show the symbol of the parameters and parameter value. User can press ◄(shift key) and ▲, ▼ key to modify the parameter value. After finish modifying parameter then press SET key save and then set next parameter.

6.2 Second level menu setting.

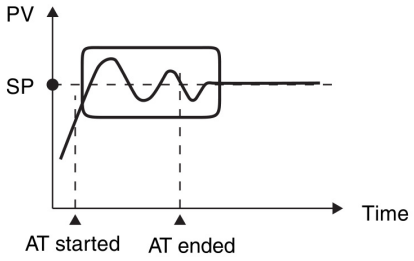
Press CH1 CH2 CH3 CH4 CH5 CH6 CH7 CH8 key for 3 seconds then enter into each channel's second level menu. User can press ◄(shift key) and ▲, ▼ key to modify the parameter value. After finish modifying parameter then press SET key save and then set next parameter.



7. Determining PID Constants (Auto-tuning)

When AT is executed, the optimum PID constants for the set point at that time are set automatically. A method (called the limit cycle method) for forcibly changing the manipulated variable and finding the characteristics of the control object is employed.

Set parameter HY as 0.5, if the output is relay set the t as 2, then set the AT as 1, in this time the controller enter into **Auto-tuning**. PV window will alternately Display "AT" and PV value, now meter's control way is on-off mode, after 3 times vibrating(3 control period) automatic save P, I, D parameter, the self-adjusting procession finished.



Operation will be as shown in the following diagram:

Attentions:

when **Auto-tuning**, the controller should not change the set value.

When the power off during **Auto-tuning**, it will restart **Auto-tuning** next time.

When it need artificially exit during **Auto-tuning**, set the Parameter (AT) to 0 so that can exit, but the setting result will not be valid.

8. Alarm function

Alarm (ALM) function	Alarm status[ON]	Alarm status[OFF]
Process high alarm	Measured value>Alarm set value	Measured value<Alarm set value
Process low alarm	Measured value<Alarm set value	Measured value>Alarm set value
Deviation high alarm	Measured value>Alarm set value + Set value	Measured value>Alarm set value + Set value
Deviation low alarm	Measured value<Alarm set value - Set value	Measured value>Alarm set value - Set value

Band alarm	Measured value<Alarm set value + Set value And Measured value>Alarm set value - Set value	Measured value>Alarm set value + Set value Or Measured value<Alarm set value - Set value
Out of band alarm	Measured value>Alarm set value + Set value Or Measured value<Alarm set value - Set value	Measured value<Alarm set value + Set value And Measured value>Alarm set value - Set value

10. Host communication based on MODBUS-RTU protocol [OPTIONAL]

The master controls communication between master and slave. A typical message consists of a request (query message) sent from the master followed by an answer (response message) from the slave. When master begins data transmission, a set of data is sent to the slave in a fixed sequence. When it is received, the slave decodes it, takes the necessary action, and returns data to the master.

10.1 Communication Mode:

Data bit length	Stop bits	Parity bit	Communication time interval
8-bit (Binary)	1,2	NONE	300ms

10.2 Message length of each function (Unit: byte):

Function code (Hexadecimal)	Function	Query message		Response message	
		Min	Max	Min	Max
03H	Read holding registers	8	8	7	7
06H	Preset single register	8	8	8	8

10.3 Message format

Slave address	The slave address is a number from 1 to 255 manually set at the front key panel of the controller.
Function code	Refer to **2. Message length of each function**
Data	The data to execute the function specified by the function code is sent to the slave and corresponding data returned to the master from the slave.
CRC-16	CRC-16: Cyclic Redundancy Check)

10.4 Read holding registers [03H]

The query message specifies the starting register address and quantity of registers to be read.

Slave address	Function code 03H	Register address	Quantity The setting must be 1	CRC16
Example: The contents of the holding register 1001H are the read out from slave address 1. Query message: 01 03 10 01 00 01 D1 0A Response message: 01 03 02 **00 FD** 79 C5 Explain：00FD=253,is processed as 25.3				

10.5 Preset single register [06H]

The query message specifies data to be written into the designated holding register. Only R/W holding registers can be specified. The controller EEPROM had a life span of data written to the EEPROM less than 1000,000 times

Slave address	Function code	Register address	Write data	CRC16
Example: Data is written into the holding register 0004H of slave address 1. Query message: 01 06 00 04 FF 38 88 29 Response message: 01 06 00 04 FF 38 88 29 When input set value(SV) is -20.0,-20.0 is processed as -200,-200=0000H-00C8H=FF38H				

10.6 No response

The slave ignores the query message and does not respond when:

• The slave address in the query message does not coincide with any slave address settings.

• The CRC code of the master does not coincide with that of the slave.

• Transmission error such as overrun, framing, parity and etc., is found in the query message.

• The Communication time interval less than 300ms.

10.7 Register address list:

8 channels controller is composed of two identical 4 channels controller, so it has two Slave address

Symbol	Decimal point	Real Register	Holding Register
Measured value(PV)	YES	1001H~1004H	44098~44101
The first public parameters *(Refer to 5. Parameters)*			
Lock	NO	0000H	40001
TS	NO	0001H	40002
ALP	NO	0002H	40003
Kt	NO	0003H	40004
dP	NO	0004H	40005
P-SH	YES	0005H	40006
P-SL	YES	0006H	40007
OP-B	NO	0007H	40008
Addr	NO	0008H	40009
Baud	NO	0009H	40010
The Parameters of channel 1 *(Refer to 5. Parameters)*			
SP1~ COL1	-	000AH~0012H	40011~40019
The Parameters of channel 2 *(Refer to 5. Parameters)*			
SP2~ COL2	-	0013H~001BH	40020~40028
The Parameters of channel 3 *(Refer to 5. Parameters)*			
SP3~ COL3	-	001CH~0024H	40029~40037
The Parameters of channel 4 *(Refer to 5. Parameters)*			
SP4~ COL4	-	0025H~002DH	40038~40046

Character Symbols ： This manual indicates 9-segment display characters as shown below.

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	b	C	d	E	F	G	H	I	J	K	L	M
N	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**Y**				
n	o	P	q	r	S	t	u	y				

PID-8CH Eight-Channel Temperature Controller Manual

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